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ABSTRACT

Field-independent and field-dependent college students studied a 1525-word article under a preferred or nonpreferred study condition (read only, underline, or note taking). Half of the subjects reviewed the material prior to an examination and half did not. Results indicated that field-independent subjects who used a nonpreferred study technique and reviewed generally produced the best recall and recognition scores, while field-dependent subjects performed better when using a preferred study technique and no review. The findings are discussed in terms of practical suggestions for students as well as implications for further research. (Author)

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THE EFFECT OF PREFERRED OR NONPREFERRED METHOD OF STUDY, VARIOUS STUDY TECHNIQUES, AND COGNITIVE STYLE ON RECALL AND RECOGNITION[1]

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Success in school today requires the ability to learn from written prose. During the past 10 years there has been an increasing emphasis in instructional research on the activities engaged in by students in their efforts to learn from written materials such as textbooks and articles. There has been a great deal of disagreement, though, between the findings of these studies regarding the most effective study technique. Several studies (e.g., Howe, 1970; Idstein and Jenkins, 1972) compared the effects of such common study techniques as reading, underlining, and note taking and found little, if any, differences in learning. In contrast, other studies (Annis & Davis, 1975; DiVesta & Gray, 1972) found that note taking resulted in more efficient learning than not taking notes, while other studies (e.g., Fowler & Barker, 1974) showed slight advantages for underlining but only under certain circumstances.

It seems possible that the failure of previous studies to identify a universally effective study technique may result from the neglect of the preferences of the individual learner for the study technique used. In past studies a subject who preferred underlining might have been assigned to a note taking condition or vice versa. Yet it seems likely that an individual's preference for an assigned study technique would influence a learner's success in a given instructional treatment. Previous

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studies have also neglected the effect of individual differences such as cognitive style on the effectiveness of various study techniques.

The purpose of the present study was to investigate the effect of the variables of study technique (read, underline, or notes), preference for study technique (preferred or nonpreferred), review (review or no review), and cognitive style (field-independent or field-dependent) on tests of both recall and recognition.

METHOD

Subjects

Subjects were 120 students enrolled at a midwestern university. A questionnaire was administered to all students in order to determine their preferred method of study. Subjects were then randomly assigned to either their preferred method of study or to one of their nonpreferred methods of study. The Hidden Figures Test (HFT) was used to assess a subject's cognitive style. Subjects were classified as field-independent or field-dependent on the basis of whether their HFT score was above or below the median score for their sex. Scores on the Scholastic Aptitude Test-Verbal (SAT-V) were used as a covariate for verbal intelligence.

Procedures

Subjects read a 1525-word article entitled "The Lisbon Earthquake" (Kropp, Stoker, & Bashaw, 1966). One week later an examination over the contents of the article was given. The examination consisted of 32 multiple choice questions and four essay questions each worth four points. Thus the total number of possible points was 48. Half of the subjects in the six treatment conditions of preferred reading, nonpreferred reading, preferred underlining, nonpreferred underlining, preferred note

taking, and nonpreferred note taking were randomly selected for a 10-minute review period prior to the examination. The subjects in the read condition received their unmarked copy of the article to be reread for 10 minutes, the underlining treatment condition received their previously underlined article to review, and the note taking subjects received their previously taken notes to review. The other half of the subjects had no opportunity to review before the exam. Four dependent variables were employed: score on the multiple-choice portion of the examination, score on the essay portion of the examination, total score, and the number of minutes used to complete the reading assignment. The means on the four dependent variables for these 120 subjects are presented in Tables 1, 2, 3, and 4.

RESULTS

A 3 X 2 X 2 X 2 multivariate analysis of covariance was performed using SAT-V as the covariate. The results of this analysis are presented in Table 5. This analysis indicated significant main effects for the variables of study technique (F (8, 184) = 4.37, $p < .01$), preference (F (4, 92) = 2.75, $p < .05$), and review (F (4, 92) = 3.11 $p < .05$). None of the interactions were reliable.

Separate univariate analyses of covariance were conducted for each of the four dependent variables. The results of these analyses are presented in Table 6. The analysis for multiple-choice score indicated significant differences between review and nonreview (F (1, 95) = 9.25, $p < .01$). The mean score for subjects that reviewed was 19.17 while it was only 17.57 for subjects that did not review. The univariate analysis also revealed a significant interaction of Preference by Review by Cognitive Style (F (1, 95) = 5.06, $p < .05$).

The univariate analysis for essay score indicated there was both a study technique effect and a preference effect. The analysis indicated significant differences between study techniques (F (2, 95) = 4.54, $p < .05$). The mean scores were 3.40 for readers, 4.80 for underliners, and 5.23 for note takers. The univariate analysis also revealed that a preferred study technique differed from a nonpreferred study technique (F (1, 95) = 7.10, $p < .01$). The mean score for subjects using a preferred study technique was 3.77 while it was 5.18 for subjects using a nonpreferred study technique.

The univariate analysis for total score indicated significant effects for the variables of study technique, review, and the interaction of Preference by Review by Cognitive Style. The analysis indicated significant effects for study technique (F (2, 95) = 5.25, $p < .01$). The mean scores were 20.60 for readers, 23.80 for underliners, and 24.13 for note takers. The analysis for total score also indicated that review conditions differed from nonreview (F (1, 95) = 5.20, $p < .05$). The mean score for subjects that reviewed was 23.50 while it was 22.18 for subjects that did not review. Finally, the univariate analysis indicated a significant interaction of Preference by Review by Cognitive Style (F (1, 95) = 5.34, $p < .05$).

The univariate analysis for time indicated significant differences between study techniques (F (2, 95) = 12.21, $p < .01$). As might be expected the mean number of minutes used for taking notes (20.35) was greater than the time used for underlining (18.00) which in turn was greater than the time used for reading (15.23).

DISCUSSION

In all three cases of significant effects for study technique, note takers scored better or used more time to read the assignment than underliners who scored better or used more time than readers. The results suggest that in a normal study situation where the amount of study time used is not kept constant, as was the case in the present study, the real value of underlining and note taking may lie in the fact that the use of these techniques requires the learner to spend more time with the learning material. However in the less realistic situation of many of the previous studies where the amount of study time was kept constant for subjects using different study techniques, subjects using one study technique may do approximately as well as subjects using another technique. The significant effect of preferred over nonpreferred study technique for essay scores was unexpected. This might be explained on the grounds that the use of a nonpreferred study technique results in better performance than the use of a preferred study technique due to the increased concentration and attention to the learning material required for the use of an unfamiliar study technique. The finding of a significant effect of review over nonreview for multiple-choice and total scores was as expected. Apparently review strengthens the direct or mediated linkage between the material previously encoded during the study period and the responses needed for success on a multiple-choice test.

The results of the Preference by Review by Cognitive Style interaction indicate a tendency for field-independent subjects to score better than field-dependent students except when assigned to use <u>both</u> a less effective preferred study technique and no review. These results suggest that a teacher recommend to both field-independent and field-dependent

students that they use a nonpreferred study technique to study learning material especially if they will be taking an essay test and that they review immediately before the exam especially if they will be answering multiple-choice questions. The influence of cognitive style in this interaction, however, is complex and difficult to interpret. The cognitive style main effect did not reach statistical significance, but the results of this interaction suggest that it is a complex variable that needs further investigation in order to tease out the complexities of its relationship with study techniques.

This study is only a beginning attempt to explore the wide range of problems concerned with finding effective study techniques for students with different characteristics. The results obtained in this study appear sufficiently interesting and encouraging to suggest the potential value of further research on the interaction of individual aptitudes with the effectiveness of study techniques.

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Table 1
Means of Multiple-Choice Score for
Cognitive Style Analysis (N=120)

	Read		Underline		Notes		Mean Total
	P	NP	P	NP	P	NP	
Review							19.17
Analytic	19.40	19.80	16.80	21.40	21.20	22.00	20.10
Global	16.20	18.60	21.20	18.80	13.40	21.20	18.23
Nonreview							17.57
Analytic	14.20	16.80	19.20	19.60	15.80	20.40	17.67
Global	18.80	13.80	18.20	16.80	19.20	18.00	17.47
Mean Total	17.15	17.25	18.85	19.15	17.40	20.40	

P = Preferred
NP = Nonpreferred

Table 2
Means of Essay Score for Cognitive
Style Analysis (N=120)

	Read		Underline		Notes		Mean Total
	P	NP	P	NP	P	NP	
Review							4.34
Analytic	4.20	3.00	2.20	7.20	5.40	5.00	4.50
Global	2.40	4.40	3.80	5.20	3.20	6.00	4.17
Nonreview							4.62
Analytic	2.60	3.80	5.00	6.60	4.00	7.00	4.83
Global	4.40	2.40	4.20	4.20	3.80	7.40	4.40
Mean Total	3.40	3.40	3.80	5.80	4.10	6.35	

P = Preferred
NP = Nonpreferred

Table 3
Means of Total Score for Cognitive
Style Analysis (N=120)

	Read		Unerline		Notes		Mean Total
	P	NP	P	NP	P	NP	
Review							23.50
Analytic	23.60	22.80	19.00	28.60	26.60	27.00	24.60
Global	18.60	23.00	25.00	24.00	16.60	27.20	22.40
Nonreview							22.18
Analytic	16.80	20.60	24.20	26.20	19.80	27.40	22.53
Global	23.20	16.20	22.40	21.00	23.00	25.40	21.87
Mean Total	20.55	20.65	22.65	24.95	21.50	26.75	

P = Preferred
NP = Nonpreferred

Table 4
Means of Time Used for Reading Assignment
for Cognitive Style Analysis (N=120)

	Read		Underline		Notes		Mean Total
	P	NP	P	NP	P	NP	
Review							17.70
Analytic	15.00	12.60	16.60	17.00	17.60	25.80	17.43
Global	14.80	17.00	16.00	22.00	17.20	20.80	17.97
Nonreview							18.02
Analytic	17.80	16.00	19.20	17.80	19.60	18.60	18.17
Global	14.80	13.80	16.20	19.20	20.80	22.40	17.87
Mean Total	15.60	14.85	17.00	19.00	18.80	21.90	

P = Preferred
NP = Nonpreferred

Table 5
Multivariate Analysis of Covariance for
Cognitive Style Analysis (N=120)

	df	Multivariate F
Study Technique	8/184	4.37**
Preference	4/92	2.75*
Review	4/92	3.11*
Cognitive Style	4/92	< 1
Study Technique X Preference	8/184	1.66
Study Technique X Review	8/184	< 1
Study Technique X Cognitive Style	8/184	< 1
Preference X Review	4/92	< 1
Preference X Cognitive Style	4/92	< 1
Review X Cognitive Style	4/92	< 1
Study Technique X Preference X Review	8/184	< 1
Study Technique X Preference X Cognitive Style	8/184	1.31
Study Technique X Review X Cognitive Style	8/184	1.55
Preference X Review X Cognitive Style	4/92	1.71
Study Technique X Preference X Review X Cognitive Style	8/184	1.25

*$p \leq .05$
**$p \leq .01$

Table 6
Univariate Analysis of Covariance for
Cognitive Style Analysis (N=120)

Source	df	Multiple Choice		Essay		Total		Time	
		MS	F	MS	F	MS	F	MS	F
Study Technique	2	34.92	2.52	35.51	4.54*	152.32	5.25**	390.49	12.21**
Preference	1	26.04	1.88	55.61	7.10**	113.59	3.91	21.58	< 1
Review	1	128.44	9.25**	.85	< 1	150.79	5.20*	2.30	< 1
Cognitive Style	1	19.59	1.42	3.20	< 1	49.61	1.71	4.84	< 1
Study Technique X Preference	2	30.83	2.22	13.82	1.77	85.47	2.95	50.48	1.58
Study Technique X Review	2	5.04	< 1	1.61	< 1	23.12	< 1	7.03	< 1
Study Technique X Cognitive Style	2	.47	< 1	3.22	< 1	5.95	< 1	22.19	< 1
Preference X Review	1	23.20	1.67	.60	< 1	30.35	1.05	20.36	< 1
Preference X Cognitive Style	1	25.07	1.81	.14	< 1	40.89	1.41	1.98	< 1
Review X Cognitive Style	1	5.98	< 1	.41	< 1	.67	< 1	.62	< 1

Table 6 (cont.)

Source	df	Multiple Choice		Essay		Total		Time	
		MS	F	MS	F	MS	F	MS	F
Study Technique X Preference X Review	2	2.62	< 1	15.74	2.01	28.41	< 1	9.70	< 1
Study Technique X Preference X Cognitive Style	2	20.22	1.46	13.80	1.76	64.22	2.21	21.07	< 1
Study Technique X Review X Cognitive Style	2	14.03	1.01	1.66	< 1	12.58	< 1	87.54	2.74
Preference X Review X Cognitive Style	1	70.21	5.06*	10.54	1.35	154.89	5.34*	32.55	< 1
Study Technique X Preference X Review X Cognitive Style	2	40.33	2.91	10.02	1.28	77.90	2.68	29.92	< 1
Error	95	13.88		7.83		29.02		31.99	

*p .05
**p .01
MS=Mean Square